

REMARKS

In the Office Action, the Examiner continued to reject claims 1-10 under 35 U.S.C. § 102(a) and (e) for being anticipated by Nakayama.

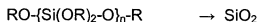
In response, claim 1 has been cancelled so that the remaining independent claims are now product claims 2 and 3 and method claims 7 and 8.

The claimed invention has the significant feature of the cocoon-shaped colloidal silica being prepared by the following two or three steps.

(Step 1) Alkoxysilane \rightarrow Alkoxysilane condensate



(Step 2) Alkoxysilane condensate \rightarrow Colloidal silica



(Step 3) The colloidal silica is further heated under pressure.

Raw material generally available on the market is alkoxysilane $[\text{Si(OR)}_4]_n$, and step 1 is known in the art. The processes that follow step 1 (preparation of an alkoxysilane condensate), however, are the present invention.

More specifically, and as defined in claims 2 and 7, the present invention comprises colloidal silica prepared by hydrolyzing an alkoxysilane condensate in the presence of an ammonia or ammonium salt catalyst. (Step 2). Applicant found, as discussed, for example, on page 4, lines 25-29 of the specification, that the resultant colloidal silica not only exhibited excellent performance as abrasive particles, but also had excellent alkali resistance.

Moreover, and as specifically defined in claims 3 and 8, if the resultant colloidal is then heated under pressure, the alkali resistance is further improved (Step 3). See page 4, line 30 to page 5, line 4 of the specification.

Dependent claims 4-6, 9 and 10 define preferred features of the invention.

Nakayama et al. discloses a process for the preparation of colloidal silica as follows:

(Step 1) Alkoxysilane → Colloidal silica



(Step 2) Heating of colloidal silica under pressure

In the claimed invention, an alkoxysilane condensate is first obtained, and then the condensate is converted to colloidal silica in Step 2 in order to manufacture colloidal silica from the alkoxysilane. In contrast, in Nakayama the process is conducted in one step.

Due to the differences between these processes, the colloidal silica prepared by Nakayama has low alkali resistance, whereas the claimed invention provides high alkali resistance.

This is demonstrated by comparing Example 1 on pages 10-12 of the specification with Comparative Example 1 on pages 13-14 of the specification. In Example 1, a "condensate of tetramethoxysilane" was hydrolyzed in the presence of ammonia, whereas in Comparative Example 1 just tetramethoxysilane was hydrolyzed in the presence of essentially the same amount of ammonia. In Example 1, the resultant colloidal silica "did not dissolve when left standing for a long period of time in an aqueous alkali solution of a pH of 11.5," while in Comparative Example 1, the colloidal silica "dissolved" in the same aqueous solution. Emphasis added. See page 12, lines 22-27 and page 14, lines 9-15 of the specification.

Moreover, the polishing rate of 0.14 $\mu\text{m}/\text{min}$ of the colloidal silica of Example 1 was better than the polishing rate of 0.09 $\mu\text{m}/\text{min}$ of Comparative Example 1 and the roughness of the polished surface of Example 1 was far superior to that of Comparative Example 1. See page 12, lines 17-22 of the specification.

Comparative Example 1 is essentially Nakayama. Note that in the Examples of Nakayama including Comparative Example 3 a methanol solution of an alkoxyasilane, here tetraethoxysilane, was mixed with an aqueous solution containing ammonia as a catalyst. This is essentially the same as Comparative Example 1 of this application. Significantly, there is no disclosure that tetramethoxysilane condensate was used, but rather just tetramethoxysilane itself. In this regard, see page 8 following Equation 1 of the specification where Applicant acknowledges that conventional processes use an "alkoxyasilane itself" as the raw material, as evidenced by Nakayama, but believed that if "an alkoxyasilane condensate" was used instead as the raw material, the number of silicic bonds would be reduced. Preferably the condensate should have a degree of condensation of about 2 to 8. (Claims 5 and 10)

Example 2 of the present application shows that heating under pressure the resulting colloidal silica improved its alkali resistance. See page 13, lines 12-14 of the specification.

Thus not only are the process steps of the claimed invention different from Nakayama because Applicant uses a different starting material, i.e., an alkoxyasilane condensate, but the resultant products are different as evidenced by their properties.

Accordingly, it is not seen how claims 2, 3, 7 and 8 or claims 4-6, 9 and 10 dependent therefrom can be considered to be anticipated by Nakayama. Its withdrawal as a ground of rejection under § 102(a) and (e) is therefore requested.

In the Office Action, the Examiner also rejected claims 1-6 under 35 U.S.C. § 102(b) for being anticipated by or alternatively under § 103(a) for being obvious over Rodel Nitta (EP'483) and claims 1-10 under 35 U.S.C. § 103(a) for being obvious over Rodel Nitta in view of So.

However, Rodel Nitta is no different than Nakayama as it also only discloses the preparation of colloidal silica directly from TMOS (tetramethylorthosilane) in a single step. The resulting particles may be cocoon-shaped, but they were not prepared by the hydrolysis of "an alkoxysilane condensate." As demonstrated in the Examples of this application, they consequently would not have the same properties as the claimed colloidal silica.

So is the same, teaching only the preparation of cocoon-shaped colloidal silica from tetramethylorthosilicate directly and not from a "condensate" thereof.

According to the claimed invention, an alkoxysilane condensate $(\text{RO}-\{\text{Si}(\text{OR})_2-\text{O}\}_n-\text{R})$ is obtained first in step 1, and then colloidal silica is obtained from this condensate in step 2 of the process. As demonstrated, with this process, the cocoon-shaped colloidal silica of the claimed invention has excellent alkali resistance amongst other properties.

For these reasons it is not believed that the claimed invention is anticipated by Rodel Nitta either nor is it obvious over Rodel Nitta alone or in combination with So.

In summary, method claims 7-10 should clearly be patentable over all of the cited references because none disclose the step of hydrolyzing "an alkoxysilane condensate" to form colloidal silica. To anticipate a claim, all of the features of the claim must be shown in a prior art reference. Moreover, since improved properties are obtained by the claimed process, it cannot be considered an obvious modification of what is disclosed either. As set forth in M.P.E.P. §716.02(a)I, greater than expected results that are of a significant, practical advantage is evidence of nonobviousness.

In addition, it is believed product claims 2-6 are also patentable over the cited references in view of the superior alkali resistance of the resulting colloidal silica. As set forth in M.P.E.P. §716.02(a)II, evidence of a superiority of a property shared with the prior art rebuts prima facie obviousness.

Reconsideration of the continued rejection of claims 2-10 in light of the above and their allowance is therefore requested. If the Examiner has any proposals for placing the claims in condition or allowance, it would be appreciated if he would contact the undersigned.

In view of the foregoing remarks, Applicant submits that this claimed invention, as amended, is neither anticipated nor rendered obvious in view of the prior art references cited against this application. Applicant therefore requests the entry of this Amendment, the Examiner's reconsideration and reexamination of the application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to Deposit Account 06-0916.

Respectfully submitted,

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